

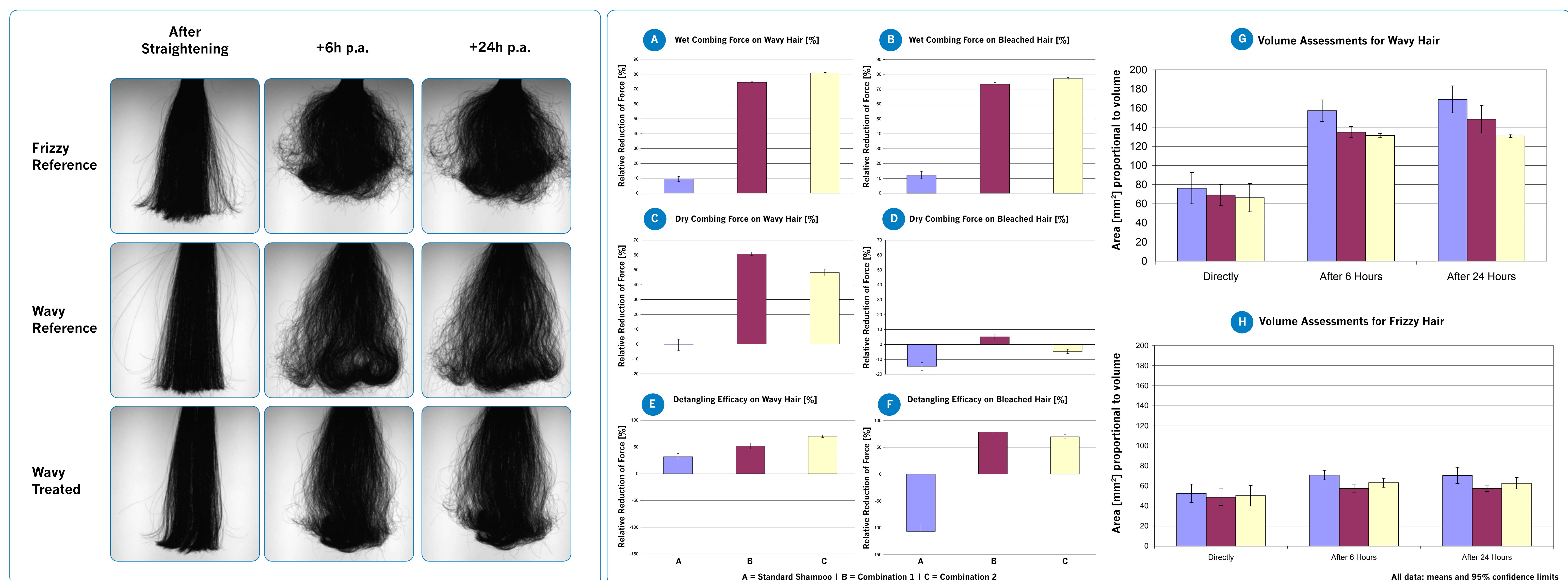
Methods to assess the efficacy of anti-frizz shampoos and conditioners

Marianne Brandt, Stephan Bielfeldt, Gunja Springmann, Klaus-Peter Wilhelm, proDERM Institute for Applied Dermatological Research GmbH, Schenefeld, Germany

Introduction

There exists a variety of methods to investigate the efficacy of hair care and hair cleansing products, such as home in use tests and sensory assessments on the one hand that give a subjective view of consumers and experts. On the other hand, biophysical investigations on hair tresses enable objectively measured results on how the products perform in e.g. combability (1, 2, 6) and improvement of hair volume (3, 4, 5). Usually, these methods are conducted on standardized straight human hair tresses to obtain a small variation in the results. For hair care products dedicated to specific hair properties like curly or frizzy hair, these methods might have only limited value.

While customers with straight hair usually have problems with combing only when the hair is quite long, those with curly and frizzy hair have always difficulties in combing and, therefore, use hair cosmetics to facilitate combing. While customers with straight hair tend to increase the volume, customers with curly and frizzy hair want to straighten the hair and reduce the volume. It was our aim to adapt biophysical methods of combing and volume detection to objectively measure these important parameters on the appropriate hair quality. We have investigated if wavy Latin-American hair quality, which is mildly frizzy, could be used to assess the efficacy of shampoos and conditioners for curly and frizzy hair. Frizzy hair qualities, in the meaning as it is discussed here, are not including the extremely curly and frizzy African hair quality. Target was the European type of frizzy hair to which the majority of products on the European market are dedicated.



Methods

Determination of wet and dry combing properties was assessed by high precision force measurements. Specifically designed devices and holders as well as pre-post treatment comparisons enable good reproducibility and low scatter of results. Five hair tresses per product were combed, and the force during combing was registered by a universal test machine (Zwicki Z0.5TN, Zwick GmbH, Ulm, Germany). For strongly frizzy hair qualities force measurements are known to be almost impossible and pose the risk to damage the device. We compared the results of bleached European hair quality to results on wavy Latin-American hair tresses. In case of dry combing, two parameters were calculated from the resulting force curves: first, the dry combability as the mean combing force during pulling the hair tress through the combing segment, excluding the part when the tips pass the comb; and second, the detangling force as the maximum force that occurs when pulling the tips through the comb. On wavy hair, pulling the tress completely through the comb was not meaningful due to development of high and extremely varying forces. Therefore, the experiment was stopped shortly before reaching the tips, and the maximum force at the stopping point was used as detangling parameter.

Volume assessments were performed by taking images of the tresses' silhouettes and further image analysis. Strongly frizzy Latin-American hair quality was compared to wavy Latin-American hair tresses. Volume assessments were performed after

product application and brushing straight during blow-drying, as well as after 6 and 24 hours of remaining in climatic conditions at $90 \pm 5\%$ relative humidity and $25 \pm 2^\circ\text{C}$.

Test products were two market product combinations, each consisting of a shampoo and a conditioner and both specifically intended to provide anti-frizz efficacy. Since the procedure of straightening during blow-drying leads to a decreasing volume independent of the cosmetic products, a reference (ethersulfate shampoo solution) was included.

Results

The results for wet combability were comparable for both hair qualities (bleached and wavy) with almost the same product differentiation (figures A and B). In case of dry combability, the results for both hair qualities also showed the same product differentiation, but on a different level (figures C and D).

The results for detangling efficacy showed clear differences between the two hair qualities that could mainly be attributed to the fact that the parameters were detected differently as described above (figures E and F). For volume assessments, both hair qualities (wavy and frizzy hair) showed comparable results with a slightly better product differentiation in case of the wavy hairs (figures G and H).

Conclusions

Biophysical methods to assess the combing-facilitating and volume-reducing efficacy of cosmetics for frizzy hair could successfully be adapted from the well-established methods on straight hair tresses to more appropriate hair qualities. Although hairs with strong frizz were found not to be usable in all methods investigated, wavy Latin-American hairs with mild aspects of frizz performed very well. Compared to the methods on straight hair, the differentiation of test products concerning the facilitation of wet and dry combing was comparably good, while for detangling further investigations are needed to establish a reliable parameter on curly or frizzy hair. For volume-reducing efficacy, the product differentiation of the mildly frizzy Latin-American hair could be compared directly to the strongly frizzy hair quality. The differentiation was found even better for the mildly frizzy hair quality, because the volume changes over time after treatment were larger compared to the strongly frizzy hairs.

References

- (1) Garcia ML, Diaz J, Combability Measurements on Human Hair. *J Soc Cosm Chem.* 27, 379-398 (1976)
- (2) Busch P, Thiele K, Eigendynamische Effekte an Haaren: Beiträge zur Methodik der Kämmbarkeit. *Ärztl. Kosmetologie* 9, 305-310 (1979)
- (3) Clarke J, Robbins CR, Reich C, Influence of hair volume and texture on hair body of tresses. *J. Soc. Cosmet. Chem.* 42, 341-350 (November/December 1991)
- (4) Robbins C, Crawford R, A method to evaluate hair body. *J. Soc. Cosm. Chem.* 35, 369-377 (1996)
- (5) Böhler A, Primmel B, Seidel W, Haarkosmetisch bedingte Volumenänderungen bestimmen. *Parfümerie und Kosmetik* 79, 26-37 (10/1998)
- (6) Jachowicz J, Smewing J, Using Texture Analysis to Substantiate Hair Care Claims. *Cosmetic & Toiletries* 121/ 9, 69-76 (September 2006)